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5. — *Statistical Atlas of the United States, based on the Results of the Ninth Census, 1870, with Contributions from many eminent Men of Science, and several Departments of the Government.* Compiled under Authority of Congress, by FRANCIS A. WALKER, M. A., Superintendent of the Ninth Census, Professor of Political Economy and History, Sheffield Scientific School of Yale College. Julius Bien, Lithographer. 1874.

GENERAL WALKER is one of the few American soldiers who, leaving the army for the civil service at the close of the war, have not rested upon a creditable military record, or betaken themselves from the camp to the caucus, but have achieved fresh distinction, and established new claims to popular confidence and gratitude by the display in administrative affairs of scientific method, enthusiastic industry, and practical skill. As chief of the Bureau of Statistics, he exhibited the qualities which almost forced his appointment to superintend the Ninth Census; and in this position his executive ability led to his appointment as Commissioner of Indian Affairs, — an office which he resigned, after too brief an occupancy, to accept the professorship at New Haven which he now fills. The civil service can ill afford to lose officers who combine literary and scientific culture with practical experience; but, on the other hand, institutions of learning are doubly blest in obtaining instructors who possess the knowledge of men and affairs, as well as of books and theories.

There is no science which more imperatively requires to be studied and handled with common-sense than the new science of statistics, particularly in its applications to vital, social, and political problems. The chemist, astronomer, or pure mathematician may pursue his inquiries in cloistered seclusion, and remain a child, in his ignorance of the world around him, outside of his special department. But the statistician must be able to combine the strictness and conscientiousness of minute inquiry with the power of wise generalization, including in his calculations incalculable elements, divining the reasons of variable phenomena, and patiently following out to demonstration the clews of his own insight. Obviously the first necessity of this process is the collection of trustworthy data; then comes the critical recognition of their incompleteness; and finally, highest and most difficult of all, the scientific discussion of the facts known, with the scientific interpolation, in due provisional measure and weight, of the facts half known or unknown.

It is matter for ever-fresh regret that Congress fell into a politi-

cians' wrangle over the new law proposed for the taking of the Ninth Census, and, not being able to agree upon the needed reforms in the system, left it in a form which was universally known to be bad. But the good workman is known by his performance with imperfect tools; and the results of the Ninth Census were obtained, under all the defects and discouragements of the law, with surprising rapidity and accuracy. As far as they go, they are trustworthy: which is the first great point. Moreover, their shortcomings are clearly recognized and pointed out in the volumes themselves: which is the second great point. And their significance has been elucidated in so many fruitful and suggestive applications by Professor Walker and his co-laborers as to confer upon the work itself an unexampled practical and popular value.

In the publication of the quarto volumes of the Census, Professor Walker obtained authority to introduce twenty-four plates, all of which, we believe, were geographical in form; that is, they were maps of the United States, upon which certain physical, vital, and industrial relations were indicated by the use of different shades of color. The experiment of reducing in this way the tables of population, nationality, disease, industry, and wealth to graphic form was very successful; and Professor Walker was authorized in 1873 to prepare — what we cannot better describe than by using the words of the Secretary of the Interior, in recommending the measure — “A Statistical Atlas of the United States, based upon the results of the Ninth Census, to contain a large number of maps, with appropriate text and tables, . . . for distribution to public libraries, learned societies, colleges, and academies, with a view to promote that higher kind of political education which has hitherto been so greatly neglected in this country, but toward which the attention of the general public, as well as of instructors and students, is now being turned with the most lively interest.”

The result of this measure is the work before us, a magnificent folio Atlas, containing sixty full-page plates, with a series of monographs from expert hands upon special topics. The typography of the text is very handsome; and the lithographic work reflects much credit upon Mr. Bien, who has in this publication equalled or surpassed all former achievements of American lithographic map-makers. The colors are well chosen, and the registering and printing in the copy before us are worthy of high praise.

We can scarcely do better than enumerate the contents of the work, by way of giving some notion of its scope and value. To follow out the innumerable suggestions of a single one of its charts

would lead us into themes too profound and too extensive for our present purpose.

The work is divided into three parts, devoted respectively to the Physical Features of the United States; Population, Social and Industrial Statistics; and Vital Statistics.

Under the first head the plates comprise maps illustrating the river systems, forest areas, rain-fall, frequency of storm-centres, mean and extreme temperatures, barometric conditions, altitudes, etc., of the United States. There is also a map of the coal-measures, by Professor Hitchcock, including all the areas east of the Missouri; but not covering the immense and but partially explored lignitic coal-fields of the Rocky Mountain system, or those still farther west, in the Pacific States and Territories. The geological map of the United States, by Professors Hitchcock and Blake, which also accompanies this part, does not throw light upon the coal-resources of the Far West, because the coal-fields of Colorado, New Mexico, Wyoming, Montana, Utah, Idaho, Oregon, and California, being Tertiary or Cretaceous in age, are colored like all the rest of the Tertiary or Cretaceous formations. The Carboniferous period is indeed largely represented in the Interior Basin, but mostly by deep-water formations. The only true Carboniferous coal reported from that region is mined on a small scale near Eureka, Nevada. But these resources are too little known or developed as yet to be tabulated or graphically represented; and we do not wonder that Professor Hitchcock has let them alone, just as Professor Blake has wisely forbore to attempt any representation in colors of the shifting and inchoate industry of gold and silver mining. Some years ago, an ambitious Commissioner of the General Land Office at Washington issued a map of the country on which the localities in the Far West, producing gold, silver, and other metals, were indicated by spots of appropriate color. But those who were acquainted with the region failed to discover why the Commissioner's spots should occupy the precise localities he had chosen for them. Spots were vanishing and new spots breaking out, every season; and the freckled map was merely laughed at. The time had not come for such a generalization. Perhaps it may be near at hand now; but the work involves a careful discussion of the observations of King, Wheeler, Hayden, and Raymond, to say nothing of earlier explorers, by some one who is familiar with the history and the latest phases of the mining industry of the West. In the present volume, we find a very general survey of the subject from the pen of Dr. R. W. Raymond, the United States Commissioner of Mining Statistics, the most important parts of which are the tables of estimated pro-

duction of gold and silver by years. Professor J. D. Whitney contributes an article on the Physical Features of the United States; Professor W. H. Brewer discusses the Woodlands and Forest Systems of the country; and Professors Hitchcock and Blake furnish appropriate text in elucidation of their geological maps. We seriously miss from this part a botanical chart of the United States, such, for instance, as Professor Porter of Lafayette College has published. It would be useful for comparison with the geological, hypsometrical, and climatic maps.

Part II. contains many of the plates with which the Census volumes have already made us acquainted, illustrating the political divisions; the various relations of population (density, birth, parentage, distribution, illiteracy, occupation); the church accommodations provided by different denominations; the characteristic crops of the country and their distribution; the relations of wealth, debt, and taxation per capita in different sections, etc. Here, as in all the plates of the Atlas, most ingenious use is made of forms and colors to represent generalized relations. The different shades of color represent on each map different degrees of the element or proportion under consideration. In the geometrical charts color has another function. For instance, in those of church accommodations and occupations, the color indicates the denomination or occupation; and the area of the diagram so colored, the proportion represented. The map illustrating the political history of our territory shows still another use of color, to indicate the successive acquisitions of territory by which the country became what it is as a whole, and the phases of political change through which each of the present political divisions (States and Territories) has passed. Thus we can trace at a glance the early struggle between England and France; the foothold of Spain in Florida and Mexico; the results of the Revolution; the settlement of the disputes between New York and Vermont, Massachusetts and Maine; the cession of Western colonial grants to the general government by many of the original States; the formation of Territories and States from these; the acquisition of "Louisiana," under which modest title we got what is now Louisiana, Arkansas, the Indian Territory, Kansas, Missouri, Nebraska, Iowa, Minnesota, Dakota, Montana, Idaho, Washington, and Oregon, with more than half of Wyoming and nearly half of Colorado; the acquisition of Florida from Spain; the annexation of Texas, then including part of New Mexico and Colorado; the conquest of California, including Utah and Nevada, with parts of Wyoming, Colorado, New Mexico, and Arizona; the purchase under the Gadsden treaty of the remainder of the two

latter Territories ; and, finally, the purchase of Alaska. An enlarged copy of this map, similarly colored, ought to hang on the wall of every American school-room. Nothing can more clearly and impressively epitomize the history of the United States. Mr. S. W. Stocking, the maker of the map, accompanies it with a full text of explanation ; but its great features, which are also its best, require nothing further. Mr. S. A. Galpin, in an article on the Minor Political Subdivisions of the United States, describes the political system based on the township as a unit, and characteristic of New England ; the county system, characteristic of the South ; and the combination of the two, or "compromise system," as he calls it, which is followed in the Northwest and larger Middle States. The article is not cumbered with argument or reflection ; it gives clear distinctions and descriptions, and then stops.

The article on the Progress of the Nation gives a tolerably good example, and the article in Part III. on the Relations of Race and Nationality to Mortality in the United States gives a very good one, of the method in which Professor Walker deals with statistical material. He is at home among the figures he has marshalled together. They march at his command. But he does not parade them in mere display or exhaust them in sham manœuvres. The article last named is specially valuable as furnishing a hint to the student of the way in which profitable use may be made of the rich material here accumulated.

Mr. E. B. Elliott, of the Bureau of Statistics, contributes some estimates of the probable population of the country in 1880, and of the population in every year since 1780, arrived at by a system of interpolation by "second differences." Mr. Elliott's estimate for 1880 is a little over 54,000,000. He also appears in Part III. as the constructor, on the basis of the very deficient vital statistics of the Census, of an approximate life table for the United States. The plates in this part comprise graphic illustrations of the local predominance of sex, of birth and death rates, and their relations to age, sex, and nationality, and to four principal classes of disease ; and of the afflicted classes, namely, the blind, deaf-mute, insane, and idiotic. In the treatment of these subjects, Mr. F. H. Wines, who constructed the diagrams, has devised a new and ingenious method of using ordinates, so as to indicate three relations at once. For instance, to represent the distribution of the blind between the two sexes and among the several periods of life, a vertical line is divided into ten equal parts, each standing for a ten-year period. At the points of division ordinates are drawn to right and left, perpendicular to the vertical.

Those to the right indicate females; those to the left, males. The length of each ordinate is proportioned to the number of blind of that sex at that age. The ends of the ordinates on each side are connected with a curve which forms the boundary of the figure; and finally, the sex which predominates on the whole is indicated by the shading of that side. The numerous little figures of this character, each occupying less than a square inch, which occupy several of the charts of vital statistics, bear witness to the compendious nature of this device.

In concluding this hasty survey of Professor Walker's admirable work, we desire to say of many of these charts what we have said already of one. They ought to be copied and enlarged and used for purposes of instruction in schools. There is much in them that cannot fail to impress even children with correct general ideas concerning the physical resources and distributed population and industries of the country; while any one of them would furnish a text for the profoundest comment on the part of the accomplished teacher or professor, in the presence of a class of advanced students. We trust some enterprising publisher will consider the feasibility of such an undertaking. A series of selected charts of this kind, especially if accompanied with a manual of explanations and additional information, references to authorities, etc., for the use of the teacher, ought to be both successful and beneficial. Indeed, the principal use of such a work should be rather the stimulation of thought and the facilitation of inquiry on the part of beginners. The true statistician maps and pictures his subjects in his head. For him rows of figures have color and voice and form. Yet even the most practised veteran in this "scientific use of the imagination" may find strange and unexpected suggestions and discoveries to spring from the contemplation of a few ingenious diagrams, in which, by a skilful use of simple symbolism, the various elements of numerous social problems are exhibited in juxtaposition or in superposition, so that their relations may be clearly seen. Indeed, without such assistance many interesting questions would scarcely be solved, and many others would never have been raised at all.

6. — *The Native Races of the Pacific States of North America.* By HUBERT HOWE BANCROFT. Vols. II., III., IV. San Francisco. 1875.

THE initial volume of the series, which promises so much for the study of American history and antiquities, has been so recently no-